

THE
TREATMENT OF UTERINE FIBROIDS
BY
ELECTROLYSIS

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UTERINE FIBROIDS

THE treatment of fibroid tumours of the uterus by electrolysis was practised before 1878 by Dr Ephraim Cutter, of New York, and the results reported to the American Medical Association. A *résumé* of the cases can be found in the 'London Medical Record' of August 15th, 1878. Other cases were reported in the same year by Dr J. M. Freeman, and this mode of treatment has since been attempted from time to time by other surgeons in America, on the Continent, and in our own country, but has never been widely adopted. Recently this mode of treatment has again been revived by Dr Apostoli, of Paris, who has modified and improved the manner of performing the operation. He has devised a large surface electrode, made of potters' clay, which is placed over the abdomen of the patient and adapts itself closely to the skin; by this means a stronger current can be employed than was formerly the case, except when needles attached to both poles were thrust into the tumour. Needles or trocars are now only used when it is found to be impossible to introduce the internal electrode

into the uterus through the cervical canal, and experience has gradually led to the punctures being made less frequently, less deep, and the duration of the flow of the current much shorter than used formerly to be the case. The current that is used is also weaker than when needles attached to both poles were employed. From all these causes the operation is much less frequently disastrous. By the means at present adopted an amount of success has been achieved which has caused the treatment of fibroids of the uterus by electrolysis to be well recognised, and led to its adoption by many physicians and surgeons. The technical knowledge required and the expense of the batteries and apparatus will no doubt limit its employment to a great extent to those who make electricity a more especial study, and to patients who are in a position to pay for a costly and elaborate operation which, of necessity, has to be frequently repeated. But it has been demonstrated beyond doubt that electrolysis when properly performed is the most certain, safest, and successful way of dealing with fibroid tumours that we possess. The tumour is seldom entirely removed, but the diminution in size is so great and the relief of distressing symptoms is so marked that few would be willing to subject themselves to the risk of an abdominal section for the removal of a tumour when so much benefit can be derived from a safe and almost painless operation.

By the theory of Grötthus electrolysis consists of a series of decompositions and re-combinations transmitted from one molecule to the next as if by a chain across the electrolyte, no appreciable change taking place except at the incidence of the respective poles; the electro-positive elements are liberated at the negative pole and the electro-negative at the positive pole. This may be true of simple compounds, but in a complex material such as that of which the human body or a fibroid tumour is composed, it is hard to believe that no change whatever takes place through the intervening tissue when a current of electricity is passed but only at the surface of the electrodes. It would seem from clinical observation that by the passage of an electric current adventitious tissues which have been deposited are changed into a condition which allows of their being re-absorbed. This re-absorption will continue for several days after a strong current has been used. The denser the structure traversed by the current the less capable of re-absorption is it rendered. It must be borne in mind that during the passage of a current of electricity there is no doubt that the ordinary osmotic action which is continually going on in living animal tissue is accelerated in the direction from the positive to the negative pole.*

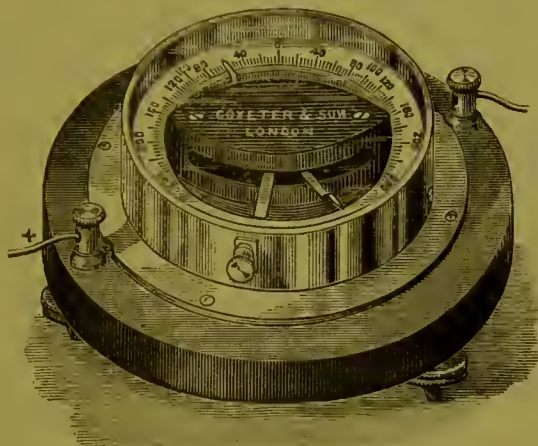
* See 'Electricity and its Manner of Working in the Treatment of Disease,' a thesis for the degree of M.D., by W. E. Steavenson, pp. 24 and 25: J. & A. Churchill, London, 1884.

A Stöhrer's battery (see p.) is the best to use for the electrolysis of fibroids, because the electro-motive force is high and the internal resistance low, and polarization does not take place to such an extent as in many other forms of battery. A battery of thirty cells will be found sufficient, and when the cells have been freshly charged and the plates newly amalgamated it will seldom be necessary to bring more than eighteen or twenty-two cells into the circuit to give a current strength of 100 milliampères when the external large surface electrode of potters' clay is used for covering the abdomen.

Leclanché batteries are also used for this operation, but more cells are required, on account of their lower electro-motive force and greater internal resistance, and the number has to be gradually increased to keep up the required current strength, on account of the rapid increase of the internal resistance which takes place in consequence of polarization. A Leclanché battery is more portable than a Stöhrer's, and therefore can be more easily taken to a patient's house.

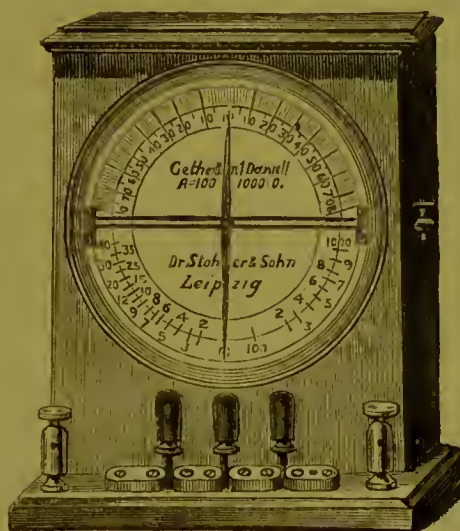
The *current strength* is regulated by a galvanometer. The one used by Dr Apostoli is horizontal, and graduated so as to indicate at least 250 milliampères. A vertical galvanometer, as made by Dr. Stöhrer, can also be used, and will register a current strength of 1000 milliampères (or one ampère). A Stöhrer's galvanometer possesses a marked binding screw,

FIG. 1.



Dr Apostoli's Galvanometer.

FIG. 2.



Dr Stöhrer's Galvanometer.

which must always be connected with the positive pole of the battery, and then, by lifting the right hand peg, a resistance of about 100 ohms is introduced into the circuit, and the needle swings to the left and will register up to 40 milliamperes. If the middle peg is removed as well as the right-hand one, a resistance of nearly 1000 ohms is introduced into the circuit, and much smaller currents can be easily registered. To detect strong currents, such as are used in the electrolysis of fibroids, it is necessary to keep the middle and right-hand pegs in their proper holes and to remove the left-hand peg, the needle then swings to the right; the graduated spaces each indicate 100 milliamperes, and extend up to 1000.

The potters' clay electrode introduced by Dr Apostoli, and which is used as the external electrode for covering the abdomen of the patient, is prepared by moistening the clay to the consistency of soft putty and spreading it out half an inch thick on a piece of tarlatan or net, the dimensions of which should be about twelve inches by twenty-six. The clay is spread over about half this surface, that is, about nine inches by twelve, the remainder of the tarlatan or net is folded over so as to cover the upper surface of the clay, and to prevent as much as possible the smearing of the patient's clothes. A hole is cut in the upper layer of the net, and a piece of soft metal, such as tin, possessing a binding screw upon

its upper surface, is passed under the net and allowed to rest on the surface of the clay. To the binding screw is attached one of the rheophores leading from the battery. No more convenient electrode has as yet been devised that will adapt itself so closely to the inequalities of an abdomen often enormously distended by a tumour; but the potters' clay electrode has many disadvantages—it is very difficult to keep it warm, and therefore often when first applied strikes very cold to the patient; its preparation is disagreeable and messy work, and the clay more or less oozes through the meshes of the material on which it is spread, and adheres to the patient's skin and clothes. Some better form of electrode that will diffuse the current equally over a large surface is much to be desired.

The electrodes used for applying the current internally are of different patterns, according to the description of tumour that is to be dealt with, and whether or not a sound can be passed into the uterus through the os and cervical canal. In the former methods of treating fibroid tumours by electrolysis, galvanopuncture was practised much more frequently than is now the case. Many of the punctures were made through the abdominal walls, and careful directions were given, in descriptions of the operation, as to how the needles were to be introduced and removed. The former operations were from this cause much more

serious and risky, and on the whole, even when no unfavorable symptoms occurred, were not so satisfactory in their results as these operations are at the present day.

When it is possible to pass a sound into the uterus Dr Apostoli uses a platinum rod about a foot long, blunt at one end and pointed as a trocar at the other. This rod is about the size of an ordinary sound, and can be passed into a cannulated handle, and fixed by a screw swivel on its side. Either end can be thus fixed according to the requirements of the operation.

FIG. 3.



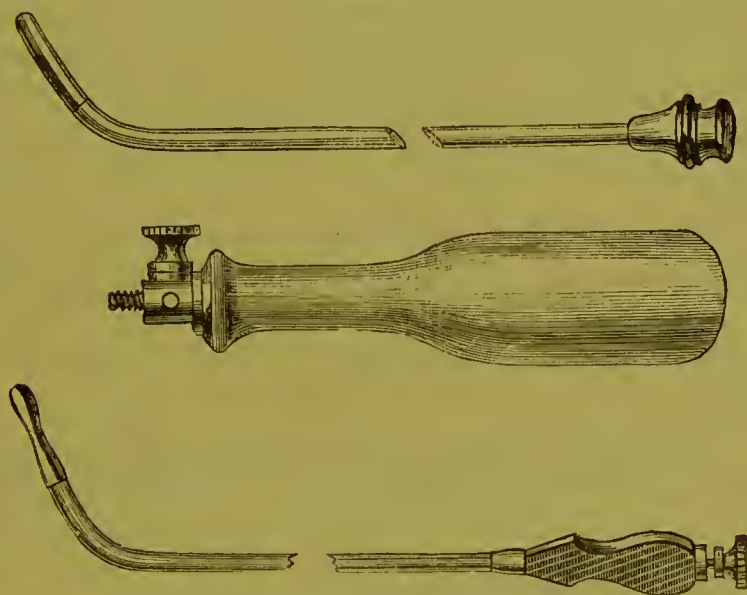
Apostoli's Intra-uterine Electrode.

At first the whole rod was made of platinum, but now the trocar half is made of steel, as steel takes a better point, is not so expensive, and can be used equally as well as platinum with the negative pole—the pole always employed when galvano-puncture is practised. A vulcanite or celluloid sheath is used to protect that part of the sound electrode that is in the vagina or against the vulva.

The electrode used by the author is much more flexible. It consists of a copper wire insulated by a No. 5 or 6 English gum elastic catheter. The last inch consists of a piece of platinum of the same size

as the catheter, welded on to the end of the copper wire. The electrodes are made so that they can be used with an ordinary handle, or are provided with a Brodie's handle possessing a binding screw, to which can be attached the other rheophore leading from the battery. This form of electrode is very much less ex-

FIG. 4.



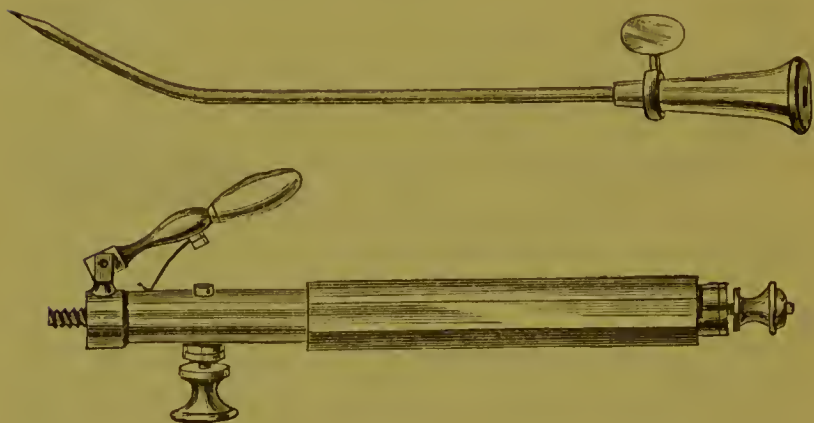
Steavenson's Intra-uterine Electrodes.

pensive on account of the smaller amount of platinum that is used in its manufacture. The flexibility is an advantage, as it enables it to be passed into the uterine cavity through the cervical canal in many cases in which it would be impossible to do so with the rigid electrode used by Dr Apostoli. When a fibroid

tumour is present, the uterus is often so tilted in one direction or another that the opening and course of the cervical canal are very far removed from the position in which they would naturally be found. And again, with the celluloid or vulcanite sheath used by Dr Apostoli it is almost impossible to shield that part of the platinum rod which is in contact with the cervical canal and os uteri. With the more flexible electrode it is quite easy to get the unprotected end of the platinum well within the uterine cavity; the gum elastic part of the stem only being in the cervical canal.

The needles for puncturing the tumours are made of platinum or steel of the shape shown in the diagram,

FIG. 5.



and are fitted on to a handle. They are intended to be used with a speculum, but might be used without

if the greater part were insulated, leaving only about an inch of the metal bare at the end.

Before commencing an operation the size of the tumour should be accurately gauged and measured so that comparison can be made during the course of the treatment, or when sufficient relief has been obtained so as to render its continuance unnecessary. In this relationship it must be remembered that in the great majority of cases, and especially in women of about middle age, as the distressing symptoms are relieved and the general health improves, there almost invariably takes place a deposition of subcutaneous abdominal fat, which would seriously invalidate the measurements if not taken into consideration. The capacity of the uterus, as evidenced by the distance to which a sound can be introduced, is one of the best guides as to increased or diminished size. The other most important measurements to be taken are :

From the tip of the xiphoid cartilage to the centre of the umbilicus.

From the xiphoid cartilage to the symphysis pubis.

From the umbilicus to the symphysis.

Girth at umbilicus.

From one anterior superior spine to the other.

From the right anterior superior spine to the umbilicus.

From the left anterior superior spine to the umbilicus.

If the tumour is at all prominent, additional measurements may be made :

From the tip of the xiphoid cartilage to the highest part of the tumour.

Girth over the most prominent part of the tumour.

From the highest part of the tumour to the symphysis ; and, if possible, the greatest width and length of the tumour taken with calipers.

After electrolysis has been performed several times, both the size and shape of the tumour will be found to be altered.

THE OPERATION.—The vagina should be syringed out with an antiseptic solution, such as dilute carbolic acid (1 in 80), and the patient placed in the dorsal position on a couch or operating table, with the buttocks brought well down to the edge. If the table does not possess supports for the feet a couple of chairs should be placed on which the feet can rest. The abdomen of the patient should now be uncovered and sponged with warm salt and water, or a warm $2\frac{1}{2}$ per cent. solution of chloride of zinc. This helps to reduce the resistance of the skin. A large surface electrode of potters' clay should now be placed upon the abdomen and pressed gently with a towel so as to make it adapt itself perfectly to the skin. Should there be any scratch, abrasion, or acne spot on the abdomen it should be first covered with a small piece of oil-silk or plaster before the electrode of potters' clay is applied.

as any such imperfection in the cuticle offers less resistance to the passage of the current, and, as the strength is increased, would cause great pain so that the patient would not be able to bear such strong currents as she otherwise would.

The electrodes, needles, or trocar, intended for internal application, as well as the handles to be used with them, should be placed by the side of the operator in a porcelain dish containing an antiseptic solution. The operator should place himself between the thighs of the patient, and having rinsed his hands in the antiseptic solution, should introduce the forefinger of the left hand into the vagina and seek for the os uteri. Should he be able to reach it, the sound electrode (Fig. 4) is passed along the finger, already in the vagina, and its end tilted up so as to make it enter the cervical canal. If possible, the internal electrode should always be passed into the cavity of the uterus, but in some cases it is accomplished with great difficulty, and occasionally is altogether impracticable, on account of the uterus being tilted and displaced by the size and weight of the tumour; but every manœuvre should be practised by which a sound can be introduced. The os can sometimes be pulled down by a hook, or pressure on the tumour through the abdominal wall will so alter the direction of the uterus that an electrode can be passed into the canal. The employment of the more flexible electrode is in these

cases a great advantage. With the index finger in the vagina, the end of the electrode, when it reaches the os, can very often be turned so that it enters the aperture.

In the majority of cases the internal electrode should be attached to the negative pole of the battery, for instance, when the tumour is of a dense and fibrous nature, accompanied by dysmenorrhœa, amenorrhœa, or the ordinary pressure and bearing-down symptoms due to its size and weight, or when reflex neurotic symptoms predominate. When the tumour is of a soft and more vascular nature, and inclined to be associated with menorrhagia, then the internal electrode should be attached to the positive pole on account of its hæmostatic action. When used with the positive pole the metal, intra-uterine portion, of the electrode should be made of platinum, because of all metals it is the least oxidisable. With the negative pole any metal may be employed, as the current does not then oxidise, and the electrode will be removed from the uterus with the metal portion as clean and bright as when introduced. When it is found necessary to puncture the tumour, for instance in those cases when a sound cannot be introduced, the needle or trocar is attached to the negative pole, and, as far as the current is concerned, may be made of any metal. Steel takes the best point, and is, therefore, the metal usually preferred.

The needles are most frequently employed with the

object of making an artificial passage into the uterine cavity, which is subsequently used for the introduction of the sound electrode; but sometimes punctures are made into dense hard tumours, when it would be quite possible to introduce an electrode through the cervical canal, so as to expedite the process of disintegration. Sometimes the punctures are used in conjunction with the intra-uterine application. All the punctures are made from the vagina, and into the most prominent part of the tumour, or into that part which will lead most readily to the uterine cavity, of course taking care that the needle does not injure any neighbouring parts, such as the bladder or Douglas's pouch, or enter into any large vessel which might be indicated by the presence of pulsation. The punctures are not made so deep as formerly, but now are usually only about half an inch in length. They may or may not communicate with the cervical canal or uterine cavity; if not, the channels made may be used for subsequent introductions of the electrode when the current is employed, or fresh punctures may be made from time to time on "suitably presenting parts of the tumour."* The punctures are made through a speculum when the needles are used; with Dr Apostoli's trocar (fig. 3) a speculum is not necessary. The needle or trocar is allowed to remain in the punc-

* Dr Apostoli's paper read at Dublin, Aug., 1887, 'Brit. Med. Journ.,' Oct. 1st, 1887.

ture for about five minutes, and 100 milliampères is the current strength which most patients can bear.

The actual cautery has not infrequently been used in the treatment of hypertrophied cervix, and by Dr Greenhalgh to favour the enucleation of fibroids; the puncture and production of a hole in the cervix uteri by electrolysis is in no way a more dangerous proceeding. The application of electrolysis is itself antiseptic, but in order that no precaution may be omitted, it is usual to have the vagina syringed out with some antiseptic solution both before and after the operation. When it is necessary to perform galvano-puncture this precaution is perhaps the more desirable.

When everything is ready and in position,—that is, the potters' clay electrode accurately adapted to the skin of the abdomen and connected with the positive or negative pole of the battery according to circumstances; the internal electrode selected and placed in position and connected with the other pole; and the galvanometer arranged so as to be included in the circuit,—the circuit is closed, and the current gradually increased in strength without any break. If when strong it gives rise to any complaint on the part of the patient, the strength must be gradually reduced again by eliminating one or two cells from the circuit, but the patient must be encouraged to bear as strong a current as she can. It will often be found that at the first application a current of more than 70 or 100

milliampères cannot be tolerated. On subsequent occasions the current can be borne stronger, and sometimes reaches as high as 250 or 300 milliampères. Anything over 100 may be considered quite strong enough to obtain results in cases of non-galvanopuncture. The time occupied by each application varies from five to eight or ten minutes. The current should be gradually reduced in strength, cell by cell, in the same way as it was increased, and the greatest care taken not to produce any shock which would be the result if the circuit were suddenly broken.

It is as well that the patient should remain in bed and quiet for twenty-four or forty-eight hours after the first application, and on subsequent occasions if there be any pain or tenderness of the abdomen ; but generally a patient may, after an hour or two's rest, walk about, and on the following day pursue her usual occupation.

The resistance the patient offers to the current varies very much with the condition of the skin at the time of the application, and with the size and moisture of the external electrode. In one case, when a current strength of 140 milliampères was used, and given by 10 cells of a Stöhrer's battery, the resistance was calculated to be about 130 ohms. In another case, with a current strength of 120 milliampères from 16 cells, the resistance was about 225 ohms. In each case the electromotive force of the battery was taken by a

voltmeter previously to the operation. In some American cases the resistance offered has been reported as low as 60 ohms; this seems almost incredible, but is probably true if the current used in any way approached in strength those recorded, viz. 500 to 1000 milliampères.

The number of applications of the current that are necessary will vary with the character of the tumour. For bleeding fibroids four or five applications are sometimes sufficient to obtain relief, although the majority require ten or twelve. Hard, dense fibroid tumours diminish in size very slowly, and may require as many as thirty applications of intra-uterine electrolysis. It is difficult to fix any exact time at which the applications should be discontinued as the tumours seldom disappear entirely. When the patient has been relieved of all distressing symptoms and the tumour is reduced sufficiently in size to cease to be an annoyance through its bulk and weight, the applications may be reasonably stopped, or only had recourse to occasionally, should any symptom return to justify it.

The frequency with which the applications should be made is also a matter which depends upon various circumstances, such as the nature of the tumour, convenience, menstruation, the effects produced, and other conditions. In some cases the applications may be made as often as twice a week, or every four days,

in others intervals of ten days or a fortnight may be necessary.

The great danger inseparable from abdominal section and the uselessness of all medicinal treatment for the removal of uterine fibroids, makes this mode of treatment by electrolysis the more acceptable and of greater importance. There are few fibroid tumours which do not cause some inconvenience, and more or less distressing symptoms. In some cases they render life almost intolerable ;—the ever constant weight and dragging pain ; the interference with digestion, defæcation, and sometimes with micturition ; the reflex neurotic symptoms and depression ; the ever constant ill-health with exacerbations at the ordinary monthly periods, sometimes with downright acute pain or profuse hæmorrhage, which incapacitates the patient for several days or a week ; the drain on the vital powers produced by this incessant pain and sometimes constant loss of blood ; all these call for some relief beyond the usual exhortation to wait for the menopause or a useless visit to Kreuznach or Horncastle. Enucleation is often impracticable, and is never unattended with danger. In electrolysis we have a means of relief, the application of which is not difficult to those who understand the medical and surgical uses of electricity. It is not unduly painful. It is, if properly applied, practically free from danger. If the tumour is not much reduced in size the distressing

symptoms are almost invariably relieved, and the patient's health improved, and she is not in a worse condition for more heroic measures, should they be deemed advisable, than before the application of electricity. The treatment is spread over rather a lengthened period of time, but after the first or second application no enforced confinement to bed is necessary or imposed upon the patient.